

Specification

1. Title of the Invention

Automated cell culturing method and apparatus for the same

2. Claims

- (1) An automated cell culturing method that is characterized in automatically carrying out in a culture chamber that maintains a constant atmosphere:
- a fluid removal step in which unnecessary culturing fluid is removed from the culture container in which the cultured cells are accommodated;
 - a peeling step in which the cultured cells are peeled from the growing surface of the culture container;
 - an agitation step in which the cultured cells are isolated by injecting new culturing fluid into the culture container and agitating the same;
 - a dispensing step in which the culturing fluid that includes a plurality of isolated cultured cells is divided and poured into two or more new culture containers;
 - a fluid supply step in which the culturing fluid is poured into the new container to compensate any insufficiency in the fluid; and
 - a culture step in which the cultured cells in the new culture container are grown.
- (2) The automated cell culturing method according to claim 1, characterized in that the peeling step comprises:
- a cleaning step in which a cleaning fluid is poured into the culture container and the cultured cells are cleaned out;
 - a fluid removal step in which the cleaning fluid is removed from the culture container;
 - an oxygen treatment step in which an oxygen liquid is poured into the culture container and the cultured cells are separated from the growing surface;
 - a fluid removal step in which the oxygen liquid is removed from the culture container; and
 - a vibrating step in which a mechanical vibration is applied to the culture container and the cultured cells are mechanically peeled from the growing surface;
- (3) The automated cell culturing method according to claim 1, characterized in that the agitation step is carried out by removing and returning the culturing fluid in the culture container several times into the same container.
- (4) The automated cell culturing apparatus, comprising:
- a culture chamber in which a constant atmosphere is maintained;
 - a fluid removal apparatus that removes unnecessary culturing fluid from the culture container in which the cultured cells are accommodated;
 - a peeling apparatus that peels the cultured cells from the growing surface of the culture container;
 - an agitating apparatus in which the cultured cells are isolated by pouring new culturing fluid into the culture container and agitating the same;
 - a dispensing apparatus in which the culturing fluid that includes a plurality of isolated cultured cells is divided and poured into two or more new culture containers;
 - a fluid supply apparatus in which culturing fluid is poured into the new container to compensate any insufficiency in the fluid; and
 - control apparatus that controls the operation of the fluid removal apparatus, the peeling apparatus, the agitating apparatus, the dispensing apparatus, and the fluid supply apparatus, wherein:
 - cultured cells for the next generation culturing in the culture chamber are

automatically produced by controlling the operation of the fluid removal apparatus, the peeling apparatus, the agitation apparatus, the dispensing apparatus, and the fluid supply apparatus by the control apparatus.

(5) The automated cell culturing apparatus according to claim 4, characterized in that an observation apparatus is provided for observing the growth state of the culture cells in the culture container from the outside.

(6) The automated culture apparatus for cells according to claim 4, characterized in that a receiving and discharging apparatus is provided in order to receive and discharge the culture container into and out of the culture chamber automatically.

(7) The automated culture apparatus for cells according to claim 4, characterized in providing a conveyance apparatus for moving the culture containers in the culture chamber towards the fluid removal apparatus, peeling apparatus, agitating apparatus, dispensing apparatus, and fluid supply apparatus.

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Below, the method and apparatus of the present invention will be explained based on an illustrating embodiment.

FIG. 1 shows an automated culture apparatus for cells that illustrates an embodiment of the present invention. This automated culture apparatus 1 is structured such that a culture chamber 3 that maintains a constant atmosphere (for example, a temperature of 37° C, a humidity of 100%, and an oxygen gas concentration of 5%) is provided in the center portion of a rectangular case 2 that forms the external frame of this apparatus 1, and various types of apparatuses are attached for applying various the operations to a dish 4, which is the culture container that is accommodated in the culture chamber 3. Specifically, this automated culture apparatus 1 includes as essential components a culture chamber 3, a receiving and discharging apparatus 5 that automatically receives and discharges the dish 4 into and out of this culture chamber 3, a conveyance apparatus 6 that moves the received dish 4 to prescribed operation locations, a fluid removal apparatus 7 that removes fluid that has become unnecessary from the dish 4 by suction, a fluid supply apparatus 8 that supplies fluid that is necessary for the culture into the dish 4, a peeling apparatus 9 that applies a vibration to the dish 4 and peels the culture cells from the growing surface, a dispensing apparatus 11 for agitating the fluid in the dish 4 and pouring fluid into other new dishes 4, a dish supply apparatus 12 for supplying new dishes 4, a control apparatus 13 that automatically controls the operation of each of the apparatuses, and an observation apparatus 14 for observing the culture cells in the dish 4 from the outside.